

(NASA-CR-162703) ANALYSIS OF EROSION AND
TRANSPORTATION FEATURES FROM LUNAR ORBITER
AND APOLLO PHOTOGRAPHY Final Technical
Report, 15 Jun. 1977 - 31 Jul. 1978 (Cornell
Univ., Ithaca, N. Y.) 11 p HC A02/ME A01

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CORNELL UNIVERSITY

Center for Radiophysics and Space Research

ITHACA, N. Y.

Final Technical Report

to the

National Aeronautics and Space Administration

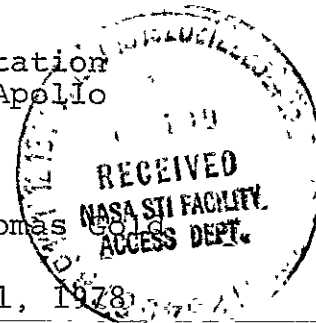
on

NASA Grant NSG-7348

"Analysis of Erosion and Transportation
Features from Lunar Orbiter and Apollo
Photography."

Principal Investigator: Professor Thomas

Period: June 15, 1977 through July 31, 1978





Center for Radiophysics and Space Research

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Ithaca, New York 14853

February 15, 1980

Dr. Bruce E. Goldstein
Code SL
National Aeronautics and
Space Administration
Washington, D. C. 20546

Dear Dr. Goldstein:

Please find enclosed three copies of the Final Technical Report on NASA Grant NSG-7348, "Analysis of Erosion and Transportation Features From Lunar Orbiter and Apollo Photography", under the direction of Professor Thomas Gold during the period June 15, 1977 through July 31, 1978.

Under separate cover, two copies of the report have been sent to the NASA Scientific and Technical Information Facility.

Yours very truly,

Ralph F. Jackson
Ralph F. Jackson
Executive Officer

RFJ:eg

cc: P. Curtiss
T. Gold

✓ NASA Scientific and Technical
Information Facility
P.O. Box 8757
Baltimore/Washington International Airport
Maryland 21240

The purpose of the project was to study and classify some of those surface features on the Moon which have been either not investigated so far or whose origin has not been understood.

We had proposed to identify certain classes of surface features in Lunar Orbiter and Apollo Panoramic Photographs, to characterize these features (in some cases by establishing scales for quantitative characterization), and to study possible correlations between the occurrence of these features and their geographical location on the Moon. We had also intended to investigate possible correlations between the occurrence of certain surface features and physical characteristics of their location, such as the surface albedo.

One of our principal aims was to investigate whether some of these features would furnish evidence of erosion and transport processes not encountered on Earth but probably taking place in a celestial body without a protective atmosphere. The surface of the Moon has been exposed to plasmas of space over geologic time, to the plasma activity in the magnetosphere of the Earth and to unknown cataclysms of the early Sun. Cometary impacts also may have generated brief intense plasmas and strong magnetic fields. An amazing variety and intensity of transport processes resulting from exposure to such plasmas was observed in our laboratory and described in our proposal.

As a result of this grant, we succeeded in carefully examining the entire set of Lunar Orbiter photographs, furthermore,

we were able to purchase, catalog and examine the complete set of Lunar Panoramic Photographs (Apollo 15, 16 and 17.)

The following surface features were observed and tabulated according to picture number and location on the Moon:

SHOULDERS (a characteristic change of slope where hills meet the planes)

ELEPHANT HIDE PATTERNS (a pattern characterized by criss-cross lines on mountain sides)

FLOW FRONTS

SHARP ALBEDO CHANGES

WRINKLES

In addition to the tabulation of the above features, maps were prepared--as shown at the end of this report--of:

- 1) Distribution of shoulders on the earthside and farside hemispheres, according to Lunar Orbiter data.
- 2) Distribution of shoulders on the earthside and farside hemispheres according to data from Panoramic Photographs.
- 3) Distribution of flow fronts shown on earthside and farside maps based mostly on data from Panoramic Photographs.

The tabulation of the above listed surface features includes observations made which describe and characterize the given feature at the specified location.

Enlargements of segments of the original photographs were made, showing specific surface features in detail, for a number of the most characteristic illustrations of these features.

Conclusions drawn from the distribution charts, the tabulated data and the quantitative characterization of surface features made possible by photographs showing fine details, will be published in a pertinent article.

We also examined a great number of Mariner and Viking photographs of the martian surface showing similar rills and related features to those observed in lunar photographs. Striking similarities between certain types of lunar and martian rills, their relationship to craters and other geographical features will be discussed in a paper in preparation. The special significance of the latter will be that the observed similarities will severely restrict the explanation of the origin of both lunar and martian rills.

FIGURE CAPTIONS

- Figure 1. Distribution of shoulders on the earthside hemisphere--Lunar Orbiter data.
- Figure 2. Distribution of shoulders on the farside hemisphere--Lunar Orbiter data.
- Figure 3. Distribution of shoulders on the earthside hemisphere according to Panoramic Photographs.
- Figure 4. Distribution of shoulders on the farside hemisphere according to Panoramic Photographs.
- Figure 5. Distribution of flow fronts--earthside, data based mostly on Panoramic Photographs.
- Figure 6. Distribution of flow fronts--farside, data based mostly on Panoramic Photographs.

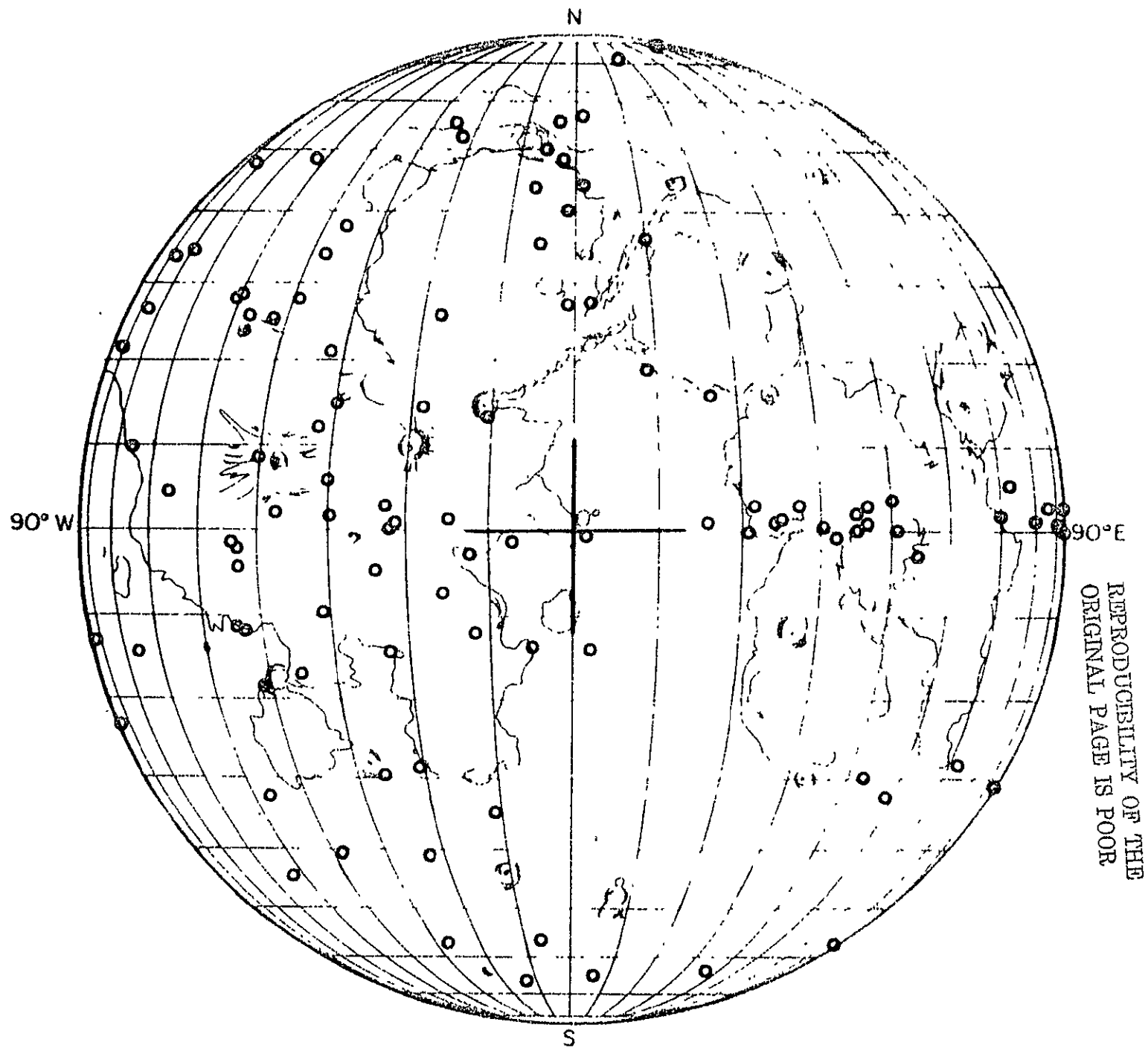
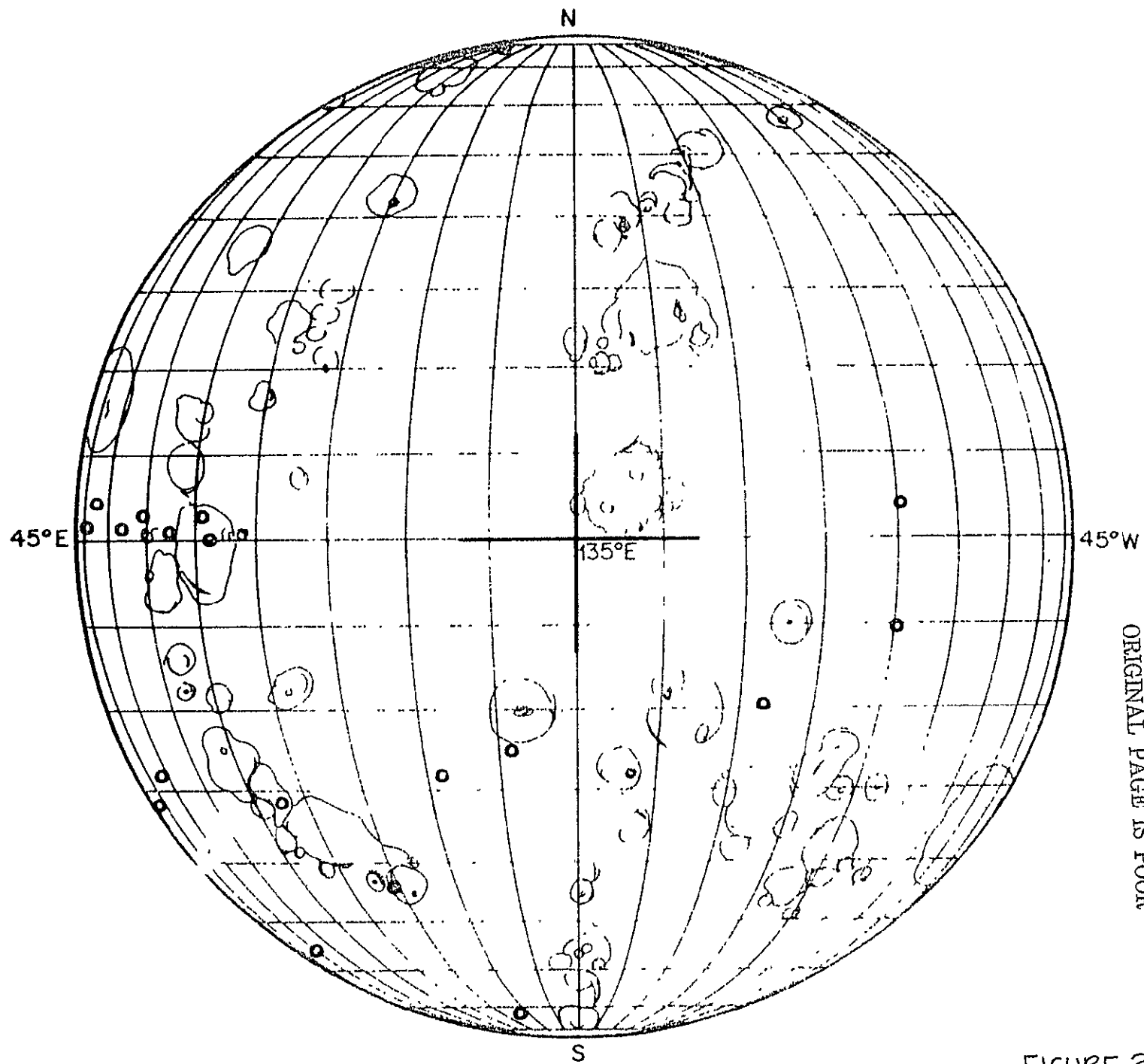
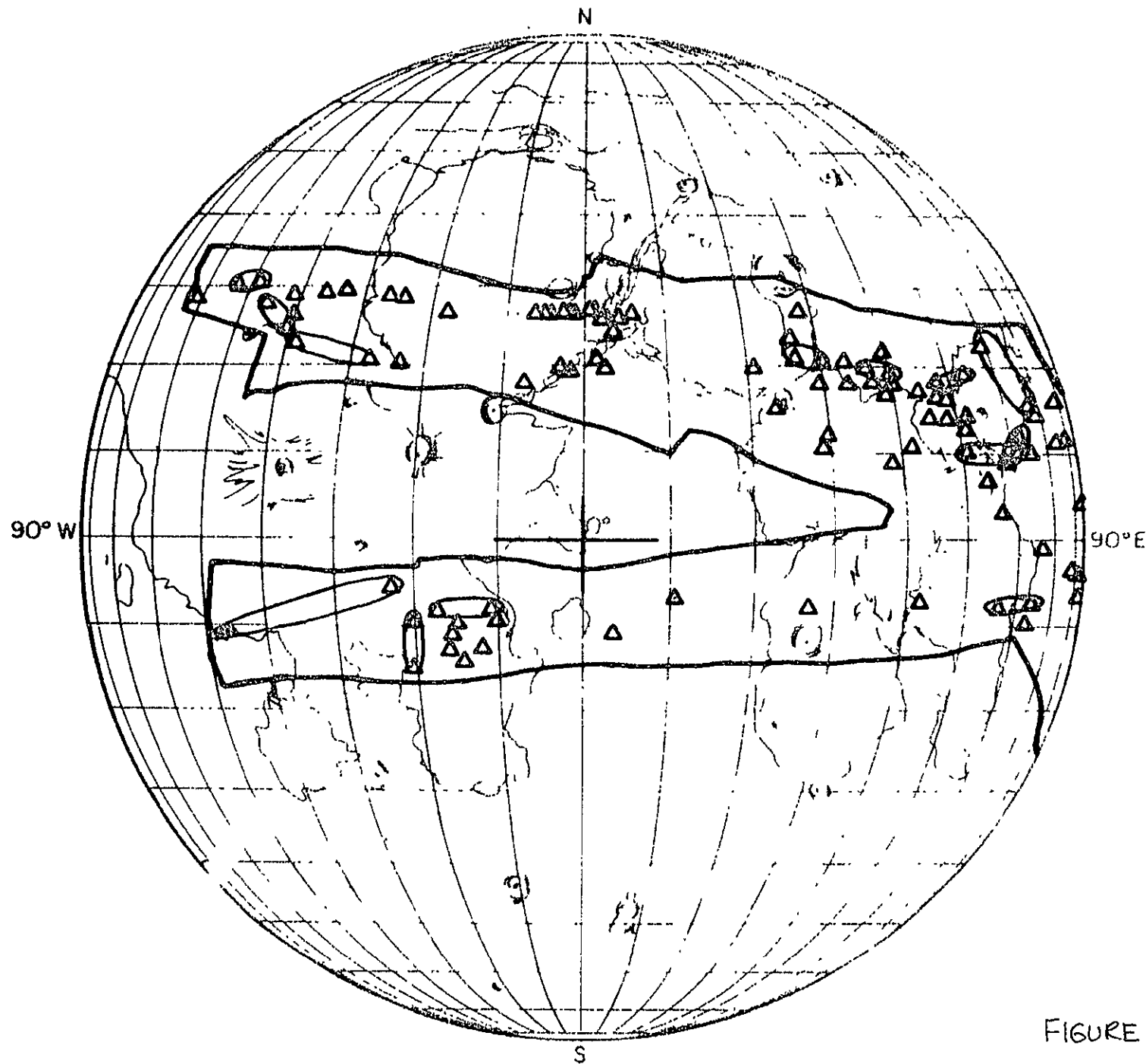


FIGURE 1



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FIGURE 2



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FIGURE 3

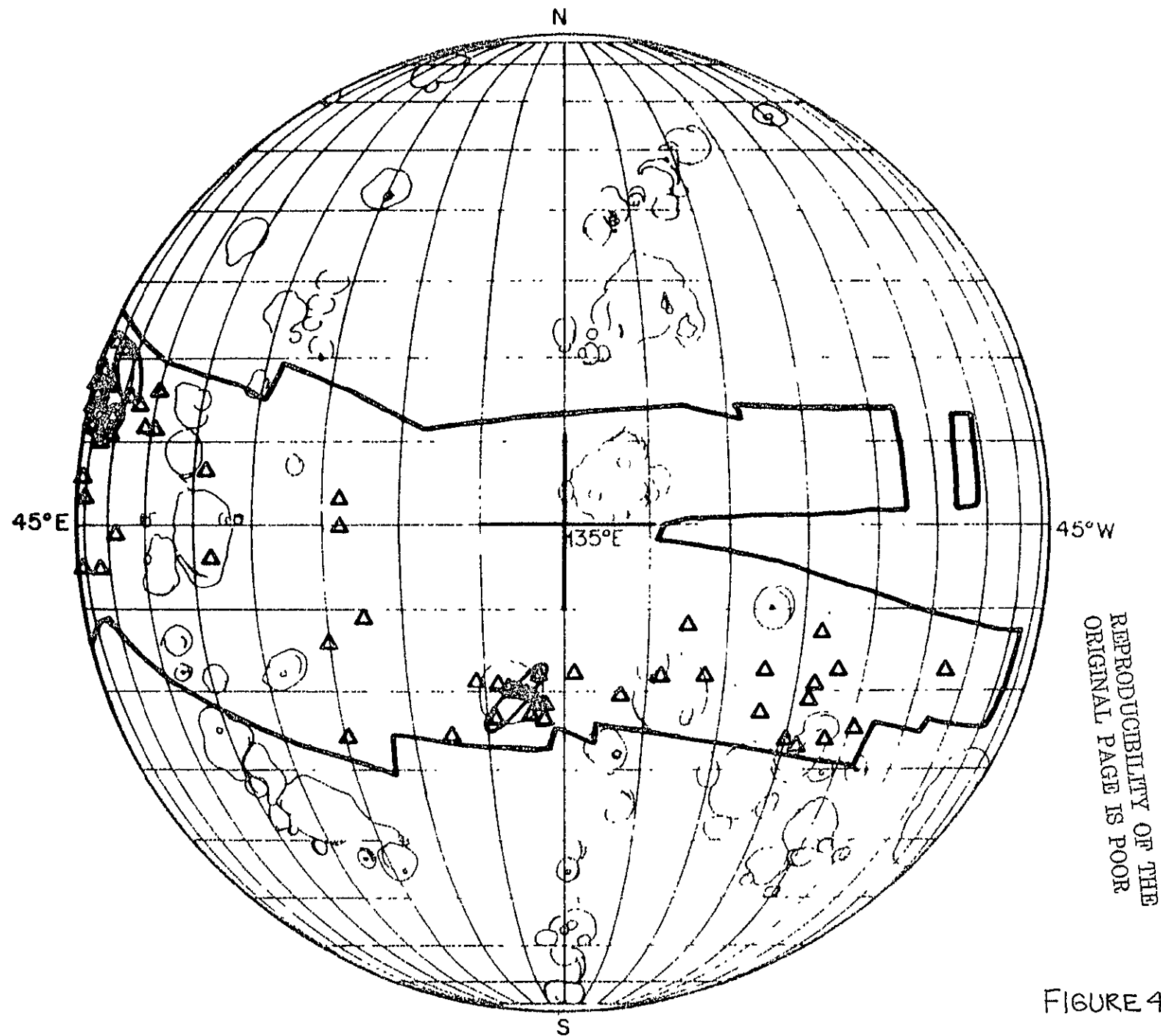


FIGURE 4

FIGURE 5

LUNAR FAR SIDE CHART



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FIGURE 6